# MATERIAL SAFETY DATA SHEET

## 1. SUBSTANCE AND SOURCE IDENTIFICATION

**National Institute of Standards and Technology**
**Standard Reference Materials Program**
**100 Bureau Drive, Stop 2320**
**Gaithersburg, Maryland 20899-2320**

**SRM Number: 2731**
**MSDS Number: 2731**
**SRM Name: Hydrogen Sulfide in Nitrogen**

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**1-800-424-9300 (North America)**
**+1-703-527-3887 (International)**

**Description:** This SRM mixture is supplied in a DOT 3AL specification aluminum (6061 alloy) cylinder with a water volume of 6 L. Mixtures are shipped with a nominal pressure exceeding 12.4 MPa (1800 psi), which provides the user with 0.73 $m^3$ (25.8 $ft^3$) of useable mixture. The cylinder is the property of the purchaser and is equipped with a CGA-330 stainless steel valve which is the recommended outlet for this hydrogen sulfide mixture. NIST recommends that this cylinder **NOT** be used below 0.7 MPa (100 psi).

**Substance:** Hydrogen Sulfide/Nitrogen Compressed Gas Mixture.

**Other Designations: Hydrogen Sulfide** (dihydrogen monosulfide; dihydrogen sulfide; hydrosulfuric acid; sulfur dihydride; sulfureted hydrogen; sulfur hydride)/**Nitrogen** (dinitrogen) compressed gas mixture.

## 2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

| Component | CAS Registry | EC Number (EINECS) | Concentration |
|---|---|---|---|
| Hydrogen Sulfide | 7783-06-4 | 231-977-3 | 20 μmol/mol * |
| Nitrogen | 7727-37-9 | 231-783-9 | balance |

* Concentration applies to the identified NIST cylinder.

**Index, R/S Phrases (EU):** Refer to Section 15 “Regulatory Information”.

## 3. HAZARDS IDENTIFICATION

**NFPA Ratings (Scale 0–4):** Health = 3 Fire = 1 Reactivity = 0

**Major Health Hazards:** Difficulty in breathing, blood damage, suffocation.

**Physical Hazards:** Cylinder may rupture or explode if exposed to heat.

**Potential Health Effects (Short Term Exposure)**

**Inhalation:** Changes in body temperature, changes in blood pressure, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, hallucinations, pain in extremities, tremors, loss of coordination, hearing loss, visual disturbances, eye damage, suffocation, blood disorders, convulsions, coma.

**Skin Contact:** No information on significant adverse effects.

**Eye Contact:** Irritation, blurred vision.

**Ingestion:** Ingestion of a gas is unlikely.

**Listed as a Carcinogen/Potential Carcinogen**

| | Yes | No |
|---|---|---|
| In the National Toxicology Program (NTP) Report on Carcinogens | | X |
| In the International Agency for Research on Cancer (IARC) Monographs | | X |
| By the Occupational Safety and Health Administration (OSHA) | | X |

## 4. FIRST AID MEASURES

**Inhalation:** If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention. **Note to Physician:** For inhalation, consider oxygen.

**Skin Contact:** Wash affected skin with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

**Ingestion:** Ingestion of gas is unlikely.

## 5. FIRE FIGHTING MEASURES

**Fire and Explosion Hazards:** Negligible fire hazard applicable to the identified NIST cylinder. Cylinder may rupture or explode if exposed to heat. Escaping gas mixture promotes combustion of surrounding materials.

**Extinguishing Media:** Regular dry chemical, carbon dioxide.

**Fire Fighting:** Move cylinder from fire area if it can be done without risk. Avoid inhalation of material or combustion by-products. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

**Flash Point (°C):** Not Applicable **Autoignition (°C):** Not Applicable **Method:** Not Applicable

**Flammability Limits in Air (Volume %): Upper:** Not Applicable

**Lower:** Not Applicable

**Flammability Class (OSHA):** Not applicable to the identified cylinder.

## 6. ACCIDENTAL RELEASE MEASURES

**Occupational Release:** Stop leak if possible without personal risk. Isolate hazard area and deny entry. Stay upwind and keep out of low areas. Refer to Section 13, "Disposal Considerations".

## 7. HANDLING AND STORAGE

**Storage:** Store and handle in accordance with all current regulations and standards. Secure cylinder to prevent physical damage. Keep valve protective cap on cylinder when not in use. Keep separated from incompatible substances. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101.

**Safe Handling Precautions:** Wear safety goggles. See Section 8, "Exposure Controls and Personal Protection".

## 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

**Nitrogen Gas**

ACGIH (inhalation): simple asphyxiant

UK OES (inhalation): simple asphyxiant

**Hydrogen Sulfide**

OSHA TWA (inhalation): 30 $mg/m^3$ (20 ppm)

ACGIH TWA (inhalation): 15 $mg/m^3$ (10 ppm)

UK WEL TWA (inhalation): 7 $mg/m^3$ (5 ppm)

**Ventilation:** Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

**Respirator:** If necessary, refer to the "NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84" for selection and use of respirators with organic vapor cartridges certified by NIOSH.

**Eye Protection:** Wear safety goggles. An eye wash station should be readily available near of handling and use areas.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

| Nitrogen Gas | Hydrogen Sulfide Gas |
|---|---|
| **Appearance and Odor:** colorless and odorless | **Appearance, Odor:** colorless, rotten egg odor |
| **Relative Molecular Weight:** 28.01 | **Relative Molecular Weight:** 34.08 |
| **Molecular Formula:** $N_2$ | **Molecular Formula:** $H_2S$ |
| **Boiling Point (°C):** –196 | **Boiling Point (°C):** –60.5 |
| **Freezing Point (°C):** –210 | **Freezing Point (°C):** –60 |
| **Vapor Density (air = 1):** 0.97 | **Vapor Density (air = 1):** 1.2 |
| **Volatility (%):** 100 | **Volatility (%):** not applicable |
| **Solubility in Water:** slightly soluble | **Solubility in Water (%):** 225.7 @ 25 °C |
| **Solvent Solubility:** soluble in liquid ammonia; slightly soluble in alcohol | **Solvent Solubility:** soluble in carbon disulfide, alcohol, ether, glycerol, gasoline, kerosene, crude oil, and alkali solutions |

**NOTE:** Physical and chemical data are for the pure components. Physical and chemical data for this nitrogen/hydrogen sulfide gas mixture do not exist. The actual behavior of the gas mixture may differ from the individual components.

## 10. STABILITY AND REACTIVITY

**Stability:** __X__ Stable _____ Unstable

Stable at normal temperatures and pressure.

**Conditions to Avoid:** Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Protect from physical damage. Cylinder may rupture or explode if exposed to heat.

**Incompatibilities:** Metals, oxidizing materials, halogens, metal oxides, metals, combustible materials, lithium.

**Fire/Explosion Information:** Refer to Section 5, "Fire Fighting Measures".

**Hazardous Decomposition:** Thermal decomposition or combustion produces nitrogen and sulfur oxides.

**Hazardous Polymerization:** _____ Will Occur __X__ Will Not Occur

## 11. TOXICOLOGICAL INFORMATION

**Route of Entry:** __X__ Inhalation _____ Skin _____ Ingestion

**Nitrogen Gas**

Compressed nitrogen gas is a simple asphyxiant.

**Hydrogen Sulfide**

$LC_{LO}$ (inhalation-man): 5700 µg/kg

$LC_{LO}$ (inhalation-man): 600 ppm/30 min

$TC_{L0}$ (inhalation-human): 0.012 mg/m$^3$

**Health Effects (Acute Exposure):**

Hydrogen Sulfide: Exposure to hydrogen sulfide at 5-50 ppm may cause mucous membrane irritation. Prolonged exposure to 50 ppm may result in pulmonary edema. Cough, olfactory paralysis, and disturbed respiration may occur at 70-150 ppm; 100-200 ppm for 1-8 hours may cause sleepiness, salivation, mucous discharge, blurred vision reaching a maximum the next day, haloes around lights, dyspnea, hemorrhage, and death. Exposure to 250-350 ppm for 1-4 hours may result in pulmonary edema, hemorrhage and death. Exposure to 500 ppm may cause hyperpnea, headache, nausea, vomiting, weakness, disorientation, and coma within 30 minutes; 600 ppm may be fatal within 30 minutes; 700 ppm may result in cardiopulmonary arrest; and 1000-2000 ppm may cause coma after 1 breath and may be rapidly fatal. Spasticity, cerebellar ataxia, tremors, convulsions, abnormal or absent reflexes, permanent brain damage and neurologic sequelae have been reported in persons rendered unconscious. Pneumonia, bronchitis, bradycardia, myocarditis, cardiac dilation, and gastrointestinal disturbances may follow acute exposures. Other reported effects include somnolence, amnesia, delirium, hallucinations, dysphagia, hypotension, pain in legs, belching, "rotten egg" breath, balance disorders, vertigo, casts in urine, non-reactive pupils, strabismus, diplopia, and exophthalmos. Additional cardiac effects may include dysrhythmias, myocardial depression, and conduction defects.
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Nitrogen: Nitrogen is a simple asphyxiant. The symptoms of asphyxia depend on the rapidity with which the oxygen deficiency develops and how long it continues. In sudden acute asphyxia, unconsciousness may be immediate. With slow development, there may be rapid respiration and pulse, air hunger, dizziness, reduced awareness, tightness in the head, tingling sensations, incoordination, faulty judgment, emotional instability, and rapid fatigue. As the asphyxia progresses, nausea, vomiting, collapse, unconsciousness, convulsions, deep coma and death are possible.

**Medical Conditions Generally Aggravated by Exposure:** Blood system disorders, heart or cardiovascular disorders, eye disorders, respiratory disorders, and nervous system disorders.

## 12. ECOLOGICAL INFORMATION

**Environmental Summary:**

Nitrogen: No data available.

Hydrogen Sulfide: $LC_{50}$ (fathead minnow), 14.9 µg/L/96 h.

## 13. DISPOSAL CONSIDERATIONS

**Waste Disposal:** The cylinder is the property of the purchaser. Dispose in accordance with all applicable federal, state, and local regulations. Hydrogen sulfide is subject to disposal regulations: U.S. EPA 40 CFR 262, Hazardous Waste Number(s): U135.

## 14. TRANSPORTATION INFORMATION

**U.S. DOT and IATA:** Compressed Gas, N.O.S. (Hydrogen Sulfide in Nitrogen); UN1956; Hazard Class 2.2.
**Canadian WHMIS:** Compressed Gas, N.O.S. (Hydrogen Sulfide in Nitrogen); UN1956; Hazard Class 2.2.

## 15. REGULATORY INFORMATION

**U.S. REGULATIONS**

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21)

| | |
|---|---|
| ACUTE: | Yes |
| CHRONIC: | No |
| FIRE: | Yes |
| REACTIVE: | No |
| SUDDEN RELEASE: | Yes |

**STATE REGULATIONS**

California Proposition 65: Not regulated.

**CANADIAN REGULATIONS**

WHMIS Classification: Not determined.

**EUROPEAN REGULATIONS**

**EU Classification**

**Nitrogen:** Not determined.

**Hydrogen Sulfide:**

$F^+$ Extremely Flammable.
$T^+$ Very Toxic.
N Dangerous for the Environment.

**EU Risk and Safety Phrases**

**Nitrogen:** Not determined.

**Hydrogen Sulfide:**

| | |
|---|---|
| R12 | Extremely flammable. |
| R26 | Very toxic by inhalation. |
| R50 | Very toxic to aquatic life. |
| S1/2 | Keep locked up and out of reach of children. |
| S16 | Keep away from sources of ignition. |
| S36 | Wear suitable protective clothing. |
| S38 | In case of insufficient ventilation, wear suitable respiratory equipment. |
| S45 | In case of accident or if you feel unwell, seek medical advice immediately (show label where possible) |
| S61 | Avoid release to the environment. |

**NATIONAL INVENTORY STATUS**

**U.S. Inventory (TSCA):** Listed on inventory.

**TSCA 12(b), Export Notification:** Not listed.

## 16. OTHER INFORMATION

**Sources:** MDL Information Systems, Inc., MSDS *Nitrogen*, 16 June 2005.
MDL Information Systems, Inc., MSDS *Hydrogen Sulfide*, 08 December 2005.